High Performance Thin Films from Solution Processible Two-Dimensional Nanoplates

Tech ID: 25180 / UC Case 2015-175-0

SUMMARY

UCLA researchers in the departments of Chemistry and Materials Science have recently developed a novel material for use in flexible, printed electronics.

BACKGROUND

Producing cheap, lightweight, and flexible electronics requires depositing electronic materials onto flexible, plastic substrates. Traditional methods of material deposition require high temperatures and/or pressures in order to produce high quality materials that are sufficiently conductive. The current material of choice for use in conductive thin films is indium tin oxide (ITO); however the cost and quality of the material make it prohibitive for cheap, flexible electronics. An ideal conductive thin film would maintain its excellent electronic transport characteristics while granting additional benefits, such as flexibility and the ability to be printed directly onto plastic substrates.

INNOVATION

UCLA researchers in the departments of Chemistry and Materials Science have recently developed a novel material based on semiconducting nanoplates for use in flexible, printed electronics. Researchers started by carefully growing two-dimensional nanoplates and then suspending them in solution to make colloidal ink. The nanoplate ink can be directly printed onto plastic substrates, while the colloidal nature of the ink reduces clumping and allows for uniform deposition. The resulting thin film is highly conductive due to the high surface area connectivity that results from the stacked nanoplates. The nanostructure additionally allows for the greater mechanical compliance needed in flexible applications. The nanoplate ink allows for highly conductive thin films to be directly printed onto flexible plastic substrates.

APPLICATIONS

- Printed electronics
- Flexible electronics
- Conformal, conductive coatings

ADVANTAGES

- Higher conductivity than similar conductive colloidal inks
- Inexpensive deposition method when compared to traditional methods
- Greater mechanical compliance for flexible applications

STATE OF DEVELOPMENT

A working prototype has been developed and tested.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,319,589	06/11/2019	2015-175

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Solution process, 2D materials, nanoplates, flexible electronics, flexible substrates, thin films, printed electronics, bismuth selenide nanoplates, bismuth telluride nanoplates

CATEGORIZED AS

- **Materials & Chemicals**
  - Nanomaterials
  - Other
  - Thin Films
- **Nanotechnology**
  - Electronics
  - Materials
  - Other

RELATED CASES

2015-175-0

RELATED MATERIALS

- Solution Processable Colloidal Nanoplates as Building Blocks for High-Performance Electronic Thin Films on Flexible Substrates, Zhaoyang Lin et al., Nano Letters 2014 14 (11), 6547-6553

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Approaching Schottky-Mott Limit in Van Der Waals Metal Semiconductor Contacts
- Chemical Vapor Deposition Growth of the Large Single Crystalline Domains of Monolayer and Bilayer
- Double-Negative-Index Ceramic Aerogels For Thermal Superinsulation
- Single-Atom Tailoring of Platinum Nanocatalysts for High-Performance Multifunctional Electrocatalysis
- Palladium Alloy Hydride Nano Materials

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